REMARKS

The amendment dated February 26, 2009 amended claim 1 but inadvertently had the identifier "original". The claim identifier should have read "currently amended".

The specification is amended on page 2, line 37 to correct an inadvertent typographical error in the patent number of the Rao et al. patent (U.S. No. 5,874,134).

The specification is amended on pages 6 and 7 to remove the word "three" as surplussage.

The specification is amended on page 14 to clarify the structure described in the cited references as being "convergent-divergent", see page 2 of the specification.

Support for the amendments to claims 1, 17 and 19 will be found throughout the disclosure of the specification including the Figures. The spacer zone having an upper diameter converging to a lower diameter tubular region and the location of the reactant inlets being positioned to introduce the reactants into the tubular region will be found on page 12, lines 14-17 and, especially, in Figures 1 and 2. The homogenizer comprising the tubular region followed by a converging section will be found on page 12, lines 27-28 and in Figures 1 and 2. The radially distributed inlets will be found on page 13, lines 12-15 and in Figure 2B. The reactant inlets being downstream of the recirculation zone will be found in the Abstract, and on page 3, lines 11-27. The flow downward through the reactor will be found on page 10, line 35 to page 11, line 2; page 12, lines 1-3 and in Figures 1 and 2A. Additional claim amendments are made to correct typographical errors.

Independent claims 1, 17 and 19 have been amended to, with more specificity, incorporate the feature of claim 22 reciting the shape of the reaction chamber.

Claim 22 was rejected as obvious over Anderson.

Figure 3 of Anderson was pointed to in the Office action for suggesting a reaction chamber comprising a straight region and a convergent region. However, in Figure 3 of Anderson, the reactants flow upward and into a quench liquid through a confined passage or convergent region. This confined passage or convergant region of Anderson is described for use with upward flowing materials to help produce a high enough velocity of the effluent gas stream to prevent flow (probably because of gravity) of quench liquid back into the passages, see Col. 4, lines 30-60. In contrast, the instant claims relate to a structure which is for downward flow of carrier gas and reactants. Anderson relates to pyrolysis of hydrocarbons as opposed to oxidation to form titanium dioxide particles. Nothing in Anderson teaches or suggests orienting the structure of Figure 3 for downward flow of reactants and carrier gas. Particle formation (carbon black) described in Anderson Example IX is a problem and is to be

minimized to reduce the maintenance problems of removing carbon deposits which plug the reactor. This would teach the person of ordinary skill in the art away from using or modifying the device of Anderson to make particles.

Further in the Office action, claim 22 is rejected as obvious over over Yuill (US 2002/019138) as applied to claim 1 and further in view of Detering et al (US 5,935,293).

Yuill provides a reactor that lacks the claimed structural features of the claims, the homogenizer, in particular.

Detering is discloses a reaction chamber comprising a straight region and a convergent region. Detering describes a converging section, see the convergent reaction chamber 10, followed by a restrictive nozzle throat 11 and a diverging region (the quench chamber 12). See Col. 10, lines 47-53. The converging section is for compressing the hot gases rapidly into the restrictive nozzle throat while maintaining laminar flow and a minimum of turbulence. The converging section of Detering lacks the claimed combination of a spacer zone having an upper diameter converging to a tubular region upstream of the reactant inlets which are positioned to introduce reactants into the tubular region and a homogenization zone which includes the tubular region followed by a converging section. Detering shows the reactant inlets positioned to introduce reactants into the plasma, see Col. 7, lines 22-30 or into the diverging section, see Col. 7, lines 65-68 (see Figs. 1 and 2). In contrast, the instant claims position the reactant inlets to introduce reactants into a tubular region, see Fig 2A, leading line 104.

A"virtual convergent-divergent nozzle" described in Detering et al., and pointed to in the Office action, in which the flow of the streams are forced in a way that the main reactant flow stream flows "as though a real convergent-divergent nozzle were present" (Col. 5, lines 22-46) teaches a main flow stream and an impeding stream that replicates flow through a converging-diverging nozzle. Cooling by way of a virtual nozzle is also mentioned. Figure 8 shows a reaction chamber having this virtual converging diverging nozzle, see Col. 25, line 60 to Col. 26, line 6. The entire reaction chamber shown in Fig. 8 is tubular. Additionally, as shown in Fig. 8, the reactant stream inlets are positioned to introduce the reactants into the diverging section of the flow (See supply lines 23 of Fig. 8). The supply inlets for the reactant streams is at what might be considered a virtual nozzle throat below a flow impedence 35 created by a reactant stream and supply inlet and there is a lower reactant stream introduced into the diverging portion of the flow which in Figure 8 continues to diverge along the length of the reactor.

No reason to modify the devices of the references in the manner claimed is apparent based on the references. The Office action suggests that the particular modifications would have been necessary to enhance heat transfer, mixing, chemical reaction are not suggested. However, Detering et al. teaches introducing the reactants into a diverging area or creating a

diverging area (flow impedence) into which reactants are introduced. Yuill lacks a reaction chamber with a straight region and a convergent section. In Anderson the device with the closest shape is for upward flow. As such, none of the references teach or suggest a device that has downward flowing carrier gas and reactants, converges to a lower diameter tubular region downstream of the recirculation zone, positions the reactant inlets to introduce the reactant into the tubular region which extends into a homogenization zone and converges to a nozzle tip which all contribute to reducing gas and particle entrainment in the reactant inlet regions and promote efficient mixing in the region downstream of the reactant inlets which features produce less aggregated nanoparticles with narrow size distribution. The structural changes that provide these advantages were not recognized in Anderson, Detering et al. or Yuill.

The Office action does not point to any teaching in the cited references, or provide explanation based on scientific reasoning, that would support the conclusion that those of ordinary skill in the art would have found it obvious to modify the devices of the references as recited in the claims.

In view of the foregoing, allowance of the above-referenced application is respectfully requested.

Respectfully submitted,

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